Canada Science and Technology Museum

Light paths activity package for students

Activity 1: Piecing it together—the electromagnetic spectrum

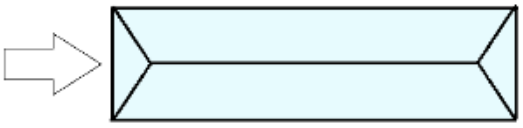
PART 1: LIGHT IT BE

Form your hypothesis!

What shape is a ray of light?

Can light pass through objects?

How will light behave when shone straight through a prism lengthwise?



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Canada

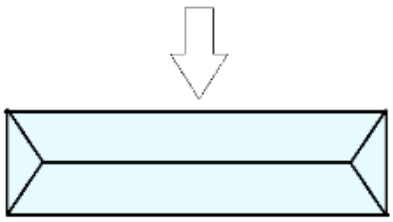
Check your hypothesis!

Shine your light through the prism lengthwise. What do you observe?

Why do you think that happens?

Form your hypothesis!

How will light behave when shone straight through a prism width-wise?



Check your hypothesis!

Shine your light through the prism width-wise. What do you observe?

Why do you think that happens?

Form your hypothesis!

What would happen if you used a **laser** instead of white light? How would the results match or differ from the results with white light?

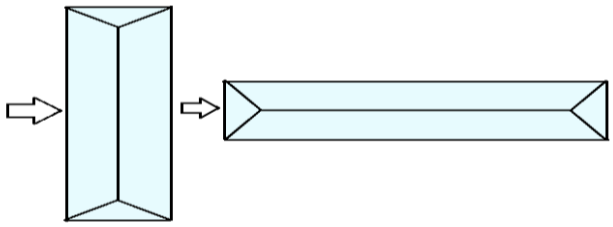
Check your hypothesis!

Test your hypothesis by shining a laser through the prism. What do you observe?

Why do you think that happens?

Form your hypothesis!

How will light behave when travelling through two prisms perpendicular to one another?



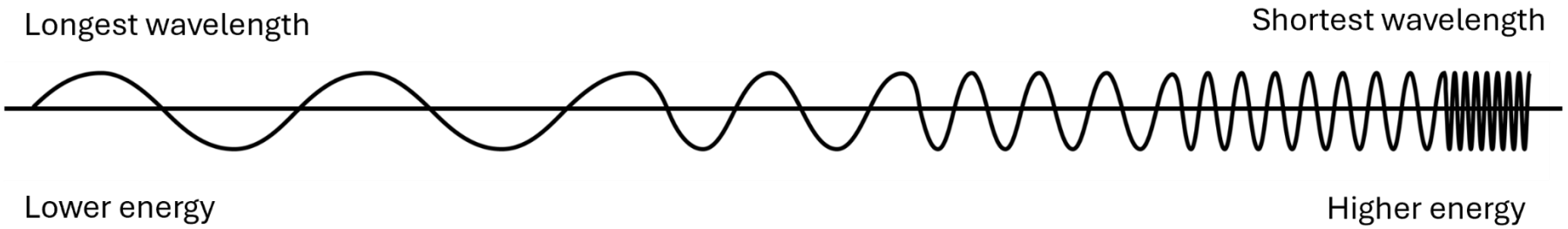
Check your hypothesis!

Check your hypothesis by placing the prisms perpendicular to one another, shining light width-wise through the first prism.

Somewhere over the rainbow

Try to create a rainbow-like light with your group, using the materials available (e.g., water, lenses, magnifying glass, mirrors). Draw what you did below.

Piecing it together—The electromagnetic spectrum



Piecing it together—The properties of light

*** For “The electromagnetic spectrum” page 5**

✂ Cut out the labels.

Cut out the labels below, which represent different types of waves. Place them on the electromagnetic spectrum diagram, in the correct order, from longest wavelength to shortest. Use the clues on the following page to help you determine where they should go.

Use the clues in the “*Colours in Visible Light*” box on the next page to colour in the boxes of the “Visible” label with the correct colour order, from longest wavelength to shortest.

Visible						

Infrared
Microwave
Gamma Ray

Radio Wave
X-Ray
Ultraviolet

Types of waves:

Label the corresponding wave type, matching its description in the table below.

Wave types:

Visible, Infrared, Radio Wave, Microwave, X-ray, Gamma Ray and Ultraviolet, along with Colours in Visible Light. Note: When using the **Visible light** label, colour in or write the name of the colours found using the prism, in the order they appear Remember: red light has more energy than violet light. Indigo light has shorter waves than orange light.

1. This type of wave is the only one we can see with the naked eye. It is composed of all the colours in the rainbow. Its waves are longer than x-rays and have more energy than infrared.
   Choose wave type:

2. This type of light can be detected with the help of night-vision goggles as they pick up the heat of our skin. This wave has more energy than a radio wave.
   Choose wave type:

3. This type of wave has less energy than both visible light and infrared. They are used by astronomers to see into Space, and by us to warm up food.
   Choose wave type:

4. This type of wave is found in the radiation of the Universe and is emitted by stars in Space. It has lower energy than a microwave. It allows you to listen to music in the car.
   Choose wave type:

5. This wave type can be emitted by hot gases from exploding stars in Space. They have shorter waves than ultraviolet light. They are also commonly used to generate images of the bones in our bodies.
   Choose wave type:

6. This type of ray is emitted by many objects in Space. It has shorter waves than visible light. These waves are known to cause sunburns, so we need to wear lotion to protect our skin.
   Choose wave type:

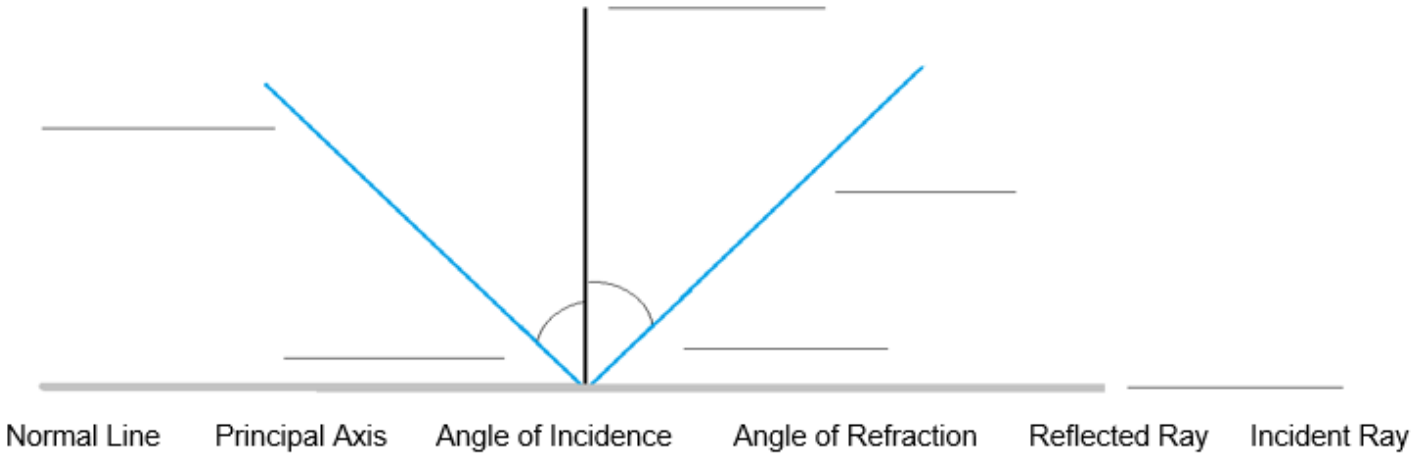
7. This type of wave can result from nuclear reactions. The Universe is the biggest generator of these waves—for example, from black holes. They are also used by doctors for imaging. This is the highest-energy wave in this activity.
   Choose wave type:

Activity 2: Now you see me, now you don’t—exploring mirrors

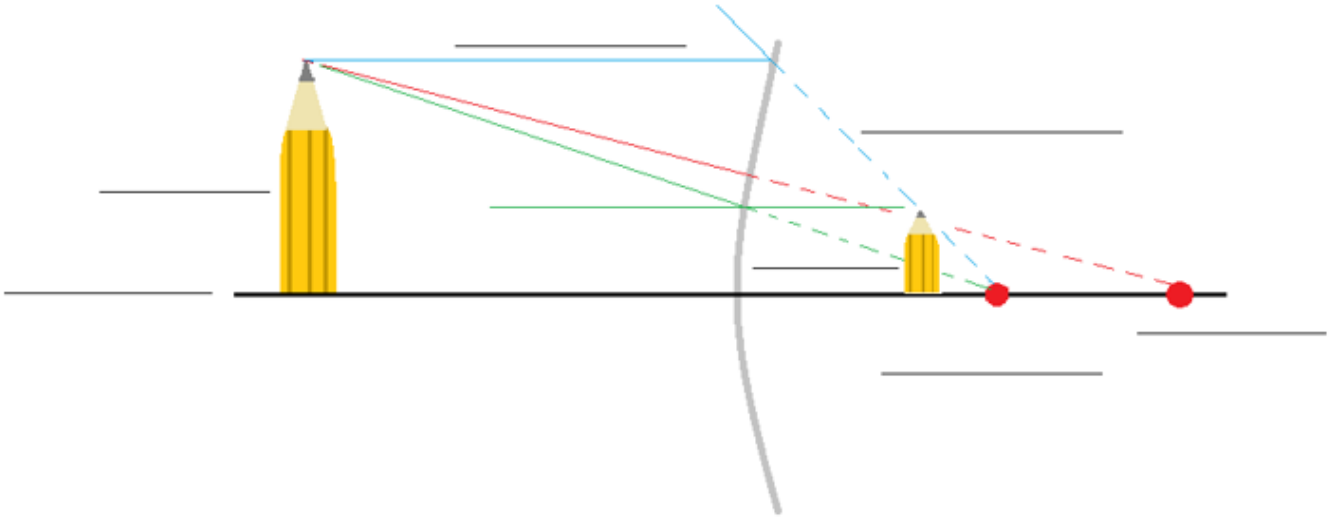
PART 1: EXPLORING DIFFERENT TYPES OF MIRRORS

Label the following diagrams with the appropriate terms.

Plane mirror

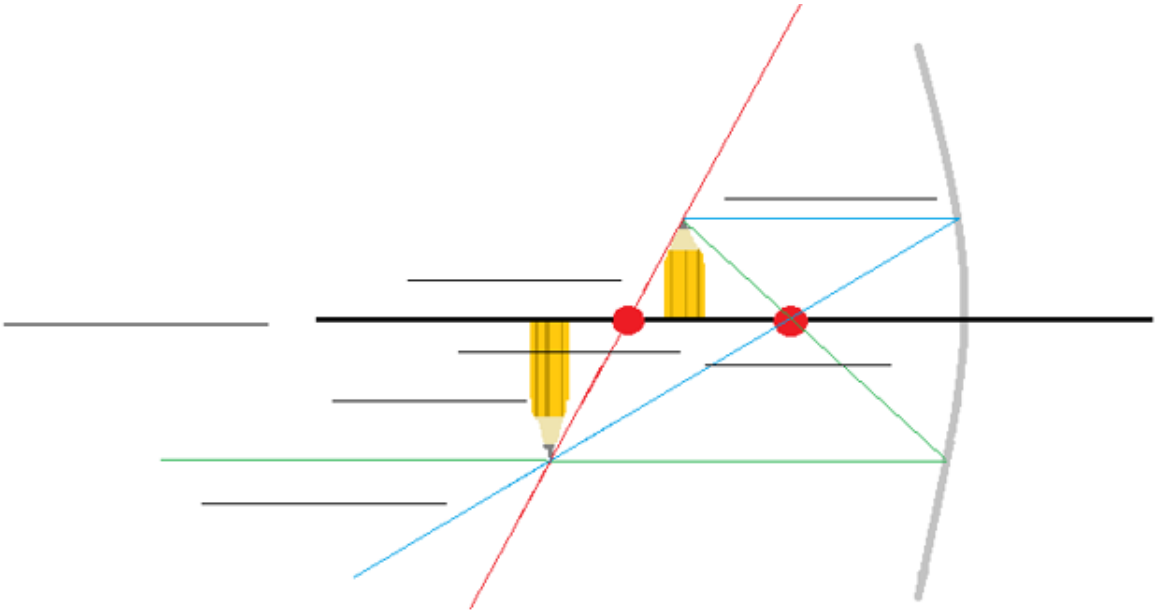


Converging mirror



Principal Axis Reflected Ray Incident Ray Focal Point Centre of Curvature Image Object

Diverging mirror



Principal Axis Reflected Ray Incident Ray Focal Point Centre of Curvature Image Object

Table 1. Images created by different types of mirrors

Draw and/or describe the images in front of the mirror, and the image reflected in the mirror. Develop a hypothesis before observing the reflected image.

Type of mirror	Object in front of mirror	Image reflected in mirror (hypothesis)	Image reflected in mirror (results)
Plane mirror			
Converging mirror (object close to mirror)			
Converging mirror (object farther away from mirror)			
Diverging mirror (object close to mirror)			
Diverging mirror (object farther away from mirror)			

PART 2: I SPY . . .VERSION 1

Sketch your location and the locations of your classmates in front of the mirror.

Length of mirror:

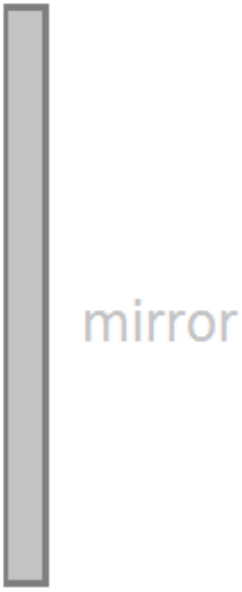


Table 2. I spy . . . who can you see from your position in front of the mirror?

Student name	Who can they see?

Table 3. I spy . . . measuring the distance from the mirror

Student name	Distance to centre of mirror	Angle from normal line

Draw a scale diagram that includes: the mirror, your position from the mirror, and your classmates' positions from the mirror.

Include a ray diagram based on your relative position to the mirror, to show who you were able to see in the mirror, and why you think that might be.

PART 2: I SPY . . .VERSION 2

Sketch the locations of the cubes or dice in front of the mirror.

Length of mirror:

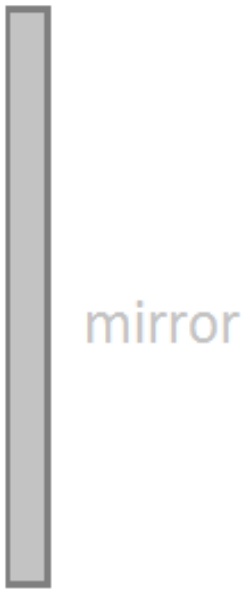


Table 4. I Spy . . . which other cubes or dice could they "see" from their position in front of the mirror?

Cube colour or die number	Which cubes or dice could they "see"?

Table 5. I Spy . . . Measuring the distance away from the mirror

Cube colour or die number	Distance to centre of mirror	Angle from normal line

Draw a scale diagram that includes: the mirror, the position of your cube or die from the mirror, and the positions of the other cubes or dice from the mirror.

Include a ray diagram based on the angle of your cube or die to the mirror, to demonstrate which other cubes or dice they could “see” in the mirror, and why that might be.

Activity 3: More than meets the eye—exploring lenses

PART 1: EXPLORING CONVERGING AND DIVERGING LENSES

Table 6. Comparing a converging lens with a diverging lens

Describe the lenses and draw a sketch of each. Explain how the lenses differ.

Lens	What does it look like? (Draw and describe)	How does it differ from the others?
Plane lens (or glass)		
Converging lens		
Diverging lens		

Table 7. How does light interact with the lenses?

Develop a hypothesis for how light will interact with particular lenses. Describe the results you get as light passes through the lenses.

Lens	Hypothesis (How do you think the lens will interact with light?)	Result
Plane lens (or glass)		
Converging lens		
Diverging lens		

PART 2: OPTICAL DEVICES AND LENSES

Table 8. Comparing optical instruments

Classify the different optical instruments, based on the types of lenses they contain. Describe the use of each optical device.

Lens	Optical instruments	Use of the optical instrument
Plane lens		
Converging lens		
Diverging lens		
Other types of lenses and/or mirrors		